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West Europe Report

SCIENCE AND TECHNOLOGY

No. 91

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CONTENTS

WORLD INTEREST IN NEW VERSION OF SWEDISH DNA MACHINE

Stockholm NY TEKNIK in Swedish 3 Dec 81 p 12

[Article by Erland Rost]

[Text] One of the world's most advanced machines for producting artificial genes--synthetic DNA--is being presented at the medical meeting in Alvsjo. Hybrid DNA for the production of sour milk, insulin, and various hormones can be produced at the same time.

The machine was presented at the beginning of the year by KabiGen and can synthesize nucleotides, the building blocks of DNA molecules, but it has now been developed considerably further.

The ABC-80 computer that guides the production process can now handle four processors at the same time. And the software has been made so flexible that each user can "customize" his own process.

It was Bengt Noren and Gunnar Pettersson who, together with Analysis Technique, Inc. of Vallentuna, produced the new version. KabiGen is still in the picture, but now as a machine customer and a partner for cooperation in the chemical engineering area.

Nothing Better

Gunnar Pettersson says:

"Since we were in on it from the beginning and produced the machine, we venture to say that not even the Americans have anything better right now. The demand for this type of synthesis equipment is enormous. What the machine makes is a DNA fragment for producing genes. Those bits of DNA are joined with the genes of bacteria which can then be made to produce insulin, for example. The entire biotechnical industry can use this type of machine for producing the "parent substance."

Production on a larger scale does not require a larger machine. Not much parent substance is needed to produce a large quantity of a certain material. More or less in the same way that not much rennet is needed to make a lot of cheese.

Just as sour whole milk is used to make more sour whole milk, so the production of the parent substance is a one-time thing.

Gunnar Pettersson says: "So it is important to be in at the start of biotechnical production. But there will also always be a need for new parent material."

The new machine, which will be marketed under the name of Nucsyn, will fit on a laboratory table and operates with the help of 10 pneumatically regulated valves which, through a sophisticated arrangement of pumps, pour the right substances in the correct sequence into a reaction vessel. The computer controls the valves and the flow. The reaction vessel is in the shape of a small column 10 centimeters high. It contains a silica gel--a so-called solid phase--in which the molecular components are built up.

The new synthesis machine is therefore suitable for both laboratories and processing firms. A machine has already been sold to the Wallenberg Laboratory in Uppsala. The machine is on display at the medical meeting in Alvsjo.

11798
CSO: 3102/121

BRITISH-JAPANESE COOPERATION AGREEMENT IN ELECTRONICS

Copenhagen DATA-NYTT in Swedish 16 Nov 81 p 11

[Text] ICL (International Computers, Ltd.), the British computer firm, has announced that a comprehensive cooperation agreement has been reached with one of Japan's largest computer manufacturers, Fujitsu. What exists now is a basic agreement that will be followed by detailed negotiations concerning the final contract.

For the ICL, the agreement means that it will have direct access to the highly advanced Japanese technology in integrated circuits without having to go through a laborious, time-consuming, and expensive research program of its own.

It is the ICL's main product, the Series 2900, that will benefit from Japanese components in the immediate future. That series currently consists mainly of the 2946 and the 2966, which have a capacity of 0.3 and 1.3 MIPS (million instructions per second) respectively. The ICL plans to present a new machine in the 2900 series in November 1981. The model designation will be 2988, and it will come in two versions: a single processor with 2.2 MIPS and a double processor with a capacity of 3.5 MIPS. Delivery date for the 2988 will probably be around the end of 1982 or the start of 1983.

ICL Aims High

The ICL shows a more open attitude toward its future product development than most other computer firms. The usual industry practice is to give out no advance information at all before the product is officially introduced on the market. The ICL, on the other hand, provides clear information on what it has in its "pipeline" (although, to be sure, it does not tell all, but provides only selected information). Further development of the 2900 series will be based on the components that Fujitsu will be able to deliver. It is stated, for example, that the intention is to use the CMOS technique not only--as now--for storing data but also for performing logical operations. This will be done by a very small, inexpensive computer with a capacity of about 0.8 MIPS that is expected to be ready for delivery in 1984.

The ICL is also going to produce quite large computers. It already has plans for a computer in the 2900 series to be delivered to customers who have outgrown the above-mentioned 2988. The size of the 2988's replacement is given as 7 MIPS. A little further in the future--perhaps by the end of the 1980's--the ICL's designers see a "supercomputer" which will produce 15 MIPS in its basic version but which, as a

multiprocessor system, will be able to handle a load of 50 MIPS. That is impressive, to say the least.

Wider Range of Equipment

Cooperation with Fujitsu will do more than give the ICL access to Japanese components. The British company will also add new products to its line.

What that refers to is Fujitsu's IBM-compatible computers, which are said to have a very competitive cost-performance ratio. With those in his sample case, the ICL salesman will have a complete range of network-oriented computers that will obviously make it easier to face what has so far been very troublesome competition from IBM.

"We Know Where We're Going"

The agreement with Fujitsu is the first big step taken by the ICL's new management (which took over early last summer) to reverse the unfavorable profit trend: a sharp drop in profits during 1980 and large losses during the first half of this fiscal year. A couple of months ago, negotiations with one or two American computer manufacturers had reached an advanced stage, but they led to nothing. In commenting on that, the ICL said very clearly that that phase in no way excluded discussions concerning cooperation with other firms.

ICL spokesmen say that the agreement also shows recognition of the fact that access to components of the highest quality is necessary for continued product development, which in turn is a prerequisite if the ICL is to be regarded as a first-class supplier by the market.

Robb Wilmot, head of the ICL, claims that the agreement with Fujitsu is an important cornerstone for building up the new ICL: "We know where we're going, and we also know how we are going to get there!"

11798
CSO: 3102/107

SIEMENS INTRODUCES NEW LARGE-SCALE COMPUTER

Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 2 Dec 81 p 1

[Text] With the new large computers 7890 and 7892, Siemens is bringing an even higher level of performance to its 7800 system. The 7892, now the largest model, has 15 times the capability of the smallest 7865-2; that means, user tasks can expand in a broad range and investments already made for software and peripheral equipment can continue to be fully utilized. The first 7890/92 computers will be delivered in spring 1983. Marketing will be in the most important markets in Europe.

With the announcement of the new units Siemens wants to underscore its continued cooperation with Fujitsu and at the same time clarify its role as the leading European supplier of compatible large-scale computers. Thus, to date, over 50 units of the 7800 system have either been installed or ordered. They operate both in the BS3000 operating system and also in the MVS, VM/370 and VS1 operating systems. The new 7890-7892 models can be operated with the MVS/SP V1 and V2 operating systems and the VM/SP Release 2 by the main competitor.

The 7890/7892 large-scale computers are distinguished by further improvement in the cost-efficiency ratio and by a maximum of safety. The model 7890 monoprocessor provides 2.1 to 2.5 times the performance of the 7880-2 model, so far the largest monocomputer in the 7800 system. The main storage capacity ranges from 16 to 64 megabytes.

The model 7892 multiprocessor likewise offers 2.1 to 2.5 times the capability of the model 7882-2 multiprocessor which to date is the largest. The main storage capacity can be expanded from 32 to 128 megabytes. Both models can be equipped with a maximum of 64 channels with an overall processing rate of up to 96 megabytes/second.

The high program capacity of the 7890 and 7892 models is achieved among other things by the three-stage storage hierarchy--main storage, nonlocal storage buffer storage and local buffer storage. An especially efficient jump instruction control decisively improves pipeline control. Distributed microprograms for control of instruction execution and control of arithmetic operations cause extremely short access times to the microprogram memories. The current version of the BS3000 operating system (BS3000 E40) is being expanded by a number of functions which make operation easier and improve efficiency. Thus, with the addressing capability of 2 gigabytes real memory the entire main memory can now also be used for normal

page changing. It can contain the extensive code and the buffer and control blocks for input and output operations and the users' data fields. Apart from some exceptions, the expanded memory is available for all address spaces. By establishing much broader parameters for the likewise expanded Decision Manager System (DSM), systems with a high load can be optimized to a substantially better degree.

With the new software production "Advanced Virtual Machine" (AVM) Siemens offers the users of the 7800 the possibility of utilizing several operating systems in one computer at the same time. In particular, AVM permits users, who presently operate a 7800 system with an operating system made by the chief competitor, gradual problem-free transition to the BS3000. In doing so, the present operating system is operated parallel to the BS3000 with AVM. The VM/370, DOS/VS, VS1 and MVS operating systems can be operated together with the BS3000.

12124
CSO: 3102/112

ELECTRONICS

NORWEGIAN FIRM FIRST TO PRODUCE LARGE LCD'S

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Dec 81 p 5

[Text] As the first company in the world, according to information it provided, the Norwegian Norsk LCD Co in Drammen near Oslo can manufacture large LCD's. The largest LCD cells which have been available on the market to date are about 3 x 12 cm. On the basis of a new patented technology the Norwegian enterprise Norsk LCD Co sees itself able to manufacture cells up to 20 x 15 cm and 30 x 30 cm, respectively, and larger. In principle, there is no limit to the size. In a report from the Norwegian consulate general in Duesseldorf it is stated that only the production equipment would have to be adapted.

This opens up new and interesting areas of application for LCD's, including automobile dashboards, the most varied kinds of information boards for the public, as for example for public long- and short-distance transport, and as visual display for new generations of telephone equipment. In connection with the last example of use, numerous markets will be opened up when development of flat data displays is completed as an expansion of the array of products.

The first request which the Norwegian company Norsk LCD Co received had to do with the manufacture of an information board, about 3 square meters, for use in railroad stations. Such large information boards and digital and analog clocks are among the products of the first generation using the large new LCD cells. The product is in any event sufficiently developed to go into series production.

But meanwhile development has progressed. In the meantime prototypes of the second generation were developed. These include instrument panels for automobiles, airplanes, ships and machines. Norsk LCD Co has just begun cooperating with Sweden's Volvo Co in order to develop such dashboard displays for automobiles. Among other things the advantage of this new technology lies in the fact that both new as well as traditional functions can be accommodated by the panels.

The third generation is also being planned. The goal of this stage of development is to develop flat data screens. At present these devices are still in the experimental stage. Several experimental data screens have, however, in the meantime been delivered to the telephone authorities. The cooperation with the Volvo Co on the one hand, and the use of this new LCD technology in many new sectors makes substantial expansion of production essential. Thus, the Norsk

LCD Co decided to seek out cooperating partners. In this they are thinking of involving a third enterprise which has suitable production technology and capacity. Moreover, they are very interested in establishing the appropriate license to manufacture abroad. In this they are also thinking of the FRG. (Norsk LCD Co., Kjeldaastoppen, N-3073 Skoger, Norway).

12124
CSO: 3102/112

ENERGY

DANES DEVELOP SOLAR-POWERED WATER PUMP FOR THIRD WORLD

Copenhagen BERLINGSKE TIDENDE in Danish 23 Sep 81 part 3 p 1

[Article by Mogens Kofod-Hansen]

[Text] It was revealed yesterday that Danish engineers have reached an advanced stage in the development of a revolutionary water pump driven by solar power. The pump is expected to create new possibilities for land usage in tropical developing countries and now barren desert regions.

This was made known when the prime minister of Zimbabwe, Robert Mugabe, visited the Grundfos pump factory in Bjerringbro, Jutland. The pump's "fuel" is heat from the sun which is absorbed by sensitive cells. Mugabe demonstrated great interest in the project which is well suited to Zimbabwe's plans for development, which are highly dependent on alternative energy.

The solar pump is a purely Danish achievement. Several large international companies have worked with the same idea, but they have given up. The World Bank then asked Grundfos to continue its efforts and now these efforts are about to be crowned with success.

So far the company in Bjerringbro has delivered several hundred diesel pumps to Zimbabwe, where African farmers have taken over large areas previously cultivated by white farmers. Grundfos is expected to be considered to receive part of a 40 million kroner loan to Zimbabwe from the Danish government which is to be used for purchases here in Denmark.

The company believes that the government of Zimbabwe could become part of a joint project to cultivate enormous, previously uncultivated, areas of land. A model for this could be the gigantic project in which Grundfos is participating in Sudan's Gezira Province between the blue and the white Nile. There the largest centrally led farm in the world has been established and the Danish company has delivered 400 to 500 of the 2,000 pumps sent to Sudan.

With solar pumps such projects will be of even greater value to developing countries. The Americans are extremely interested in the Grundfos project and yesterday Mugabe was enthusiastic over what he saw and heard in

Bjerringbro. He also visited the Dandy chewing gum factory in Vejle which, along with a local company, operates a plant in Zimbabwe.

He was unable to visit Tvind, however, as announced yesterday due to a lack of time, but he hoped to meet in Copenhagen with representatives of the Tvind schools' organization Aid to Developing Countries from People to People, whose volunteer work in Zimbabwe he praised during his visit.

Yesterday evening the prime minister spoke to the Foreign Policy Society and today he will continue his journey to Finland.

9336
CSO: 3102/103

CLOSED-CYCLE-DIESEL-POWERED MINISUB FOR INDUSTRIAL TASKS

Rome RIVISTA MARITTIMA in Italian Dec 81 pp 35, 40-50

[Article by Giuseppe Puglisi]

[Excerpts] After 9 years of work, the "Phoenix," the first submarine in the world with a closed-cycle diesel engine, will submerge shortly in the Gulf of Gaeta. It will meet industrial requirements for underwater work, requiring boats with greater power and economy than boats with electric motors. Because it is capable of developing 12 knots submerged, with a 250-mile autonomy, it will, at the same time, make the old dream of a single engine for a submarine on the surface and under water come true.

The great innovation consists of the closed-cycle engine, which finally replaces the dual diesel-electric driving apparatus, which seemed, for a century, to be inherently characteristic of a submarine, because an internal combustion engine for underwater navigation always seemed to be something like squaring the circle, owing to the unsolvable problems created by the availability of oxygen and by exhaust. In spite of that, thought was given to a single engine from the very first boats, for which the real problem was not so much hull strength as it was propulsion, precisely in that submerged environment for which these underwater means were designed.

It was learned that the obstacles encountered in these last 6 years were considerable. It was not a question of replacing atmospheric air with oxygen from cylinders, but rather of inventing a new engine that, among other things, would use carbon dioxide in place of nitrogen from the air.

A Conventional Diesel and a Closed-cycle Diesel

We shall speak of a closed-cycle diesel, but, strictly speaking, we should say semiclosed-cycle. A diesel engine is closed-cycle when its exhaust gases are recycled and are all returned to the intake of the engine itself. It is semiclosed-cycle when a small part of those gases are discharged into the sea.

Fuel Supply and Recycle

The schematic diagram of the engine of the "Phoenix 1350-1250" [at end] (a modified FIAT Alfo 8361 M engine, generating 130 horsepower at 2,250 revolutions per minute) can give an idea of its operation. The author of the project, Engineer Santi, explained its principal concepts. In a closed-cycle engine, there is a gaseous mass,

consisting of the volume of the engine (cylinder dispacement), of the intake piping system and of the exhaust piping system. The volume of that mass of gas, circulating in the system, must remain constant, in order to keep the pressure constant in the entire circuit. On the surface, it starts out with the engine circuit at atmospheric pressure and this pressure is kept constant even under water. As diesel oil is injected and burned, oxygen is drawn from its tank (with a complex system of electronic analyzers, meters and computers). During combustion, the water vapor and carbon dioxide produced have to be recycled at every revolution. The water condensate is separated and is sent to the stabilization tanks, while the gases, cooled and washed, are sorted out: the unconsumed oxygen is sent to its tank and the carbon dioxide is put back in the circuit, as a diluent of the oxygen in the engine, as has already been said. In conclusion, the exhaust is not expelled, otherwise it would be necessary to compensate for the weight with seawater. The submarine starts out with a given dispacement, consumes fuel and oxygen and returns under the same conditions, with secondary products on board, or, rather, with water, because the excess carbon dioxide has been expelled.

Exhaust Like Soda Water

There is, in fact, a small excess amount of gas that has to be expelled, a difficult problem, because the exhaust leaves the engine at the pressure of a tenth of an atmosphere and the greater the submerged depth, the more energy is required. At the maximum depth of the "Phoenix" (350 meters), the hydrostatic pressure is 35 atmospheres. Some researchers store this excess, in the closed cycle, by absorbing it chemically. In the semiclosed cycle, the Japanese say that they can pump it even from a depth of -100 meters. Engineer Santi discovered and patented a system that he has called the "mineral water" system, surprising, because with the same 5-atmosphere compressor, gas is expelled at a depth of 50 as well as 5,000 meters. Santi says that it is Columbus's egg, based on a principle of fluid mechanics and on a set of valves.

The gas to be expelled is introduced in a pressure-resistant tank in which it is dissolved, diluted in seawater brought in at outside pressure and then reduced to zero pressure. Once the gas has been absorbed, the water regains its previous pressure and is expelled into the sea as "soda water." This explanation is rather sketchy and the picture is somewhat simple, but the system operates excellently. Water enters and goes out regularly without varying the weight of the boat and the stoichiometric relationship--proportional relationship of the components combined with each other--remains unvaried in the system.

The "Phoenix" Research Phase

These and so many other problems were identified over all these years and solved one by one in the Research and Development Section of Sub Sea at Zingonia with original systems and inventions, some of them patented, the result of months of designing, discussion, calculation, testing, disappointment, modifications, new tests. At another time, we shall relate how the constructive plan of the "Phoenix" was arrived at, phase by phase, and then we shall also mention those who worked and suffered, because designing is exciting, constructing is promising, but experimenting, modifying and testing again is tormenting and this will be mentioned in speaking of the birth of the first closed-cycle diesel engine. For now, we shall only say that, after numerous, lengthy bench tests of various engines, at Zingonia

and then at sea, on the PH-XO2, for over 6,500 hours, it can be believed that the engine is a reality. These interminable hours of testing were what made us decide to make this preannouncement of the first submarine in the world that will sail with a closed-cycle diesel engine, although it it still in the construction stage.

We must explain what the PH-XO2 is. After the hundreds of hours of testing the first experimental engines at Zingonia, conducted in 1976, those results and that kind of testing no longer sufficed, because it was also necessary to test under water, to build a self-propelled underwater laboratory. The pressure-resistant steel toroid of the "Capshell." In 1977, modification of the experimental submarine PH-XO2 was planned and accomplished. Since then, all the new engines and components of the "Phoenix" project have been tested. The "Capshell" was not sacrificed for the PH-XO2, already part of the "Phoenix-66" project,[4] but some of its operational capabilities were added to those of the "Phoenix." Therefore the "Phoenix" became, in planning, a submarine with a hatch on the bottom for frogmen,[5] a "lockout submersible"[6] as they are called in international underwater terminology. The first tests of the "PH-XO2" took place in 1978, in the waters of Fiumicino (Rome) where the organizational base of Sub Sea is located and then in waters of the Gulf of Gaeta. These tests were constantly consistent with the tests in the Zingonia shops. Two years after those initial tests, the author of the "Phoenix" project pointed out, in October 1980, in an EEC conference in Luxembourg, the practical prospects for using the "Phoenix" submarine--now under construction at Zingonia--that could already be scheduled.

Sub Sea did not want merely a new engine, but also the entire engine-submarine system, to be used in its underwater work. The result is the "Phoenix 1350-1250" now at Gaeta. Once every kind of test had been determined, once change of the final engine model had been completed and perhaps checks had been made of the latest modifications of the entire system, suggested by the experience accumulated in those 3 years by the "PH-XO2," the executive construction plan was set up in July

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[4] The "Phoenix-66" project included extemporaneous incorporation of the "Capshell," with the frogmen inside, within the hull of the "Phoenix," for transportation and positioning of that capsule on the head of a oil well, where the frogmen would have to work to connect piping and valve rigging, while the "Phoenix" would carry on its work elsewhere.

[5] The minisubmarine USEL of our ship "Anteo" is equipped with a similar system, in its emergency model for rescuing the personnel of damaged submarines. See Tiberio Moro, "The 'Anteo' and Its Underwater and Rescue Components," RIVISTA MARITTIMA, April 1960, pp 34-38.

[6] The so-called lockout submersible system, created and carried out by E. Link in his "Deep Diver" (1967), eliminates use of the diving bell and the dangers associated with hoses and cables hanging from the support ship. The submarine takes the frogmen on board, without any pressure changes, from the decompression chamber of the support ship, takes them to the work site and there they exit on the bottom, attended by the nearly submarine, which provides them with everything they need.

1980. It was hoped to launch the boat at the end of 1980, but the higher safety margins that the company had imposed on itself, exceeding even the specifications of the Naval Register, lengthened the construction time.

The structural and operational characteristics of the "Phoenix" are given in table A [at end]. The leading ones are a speed of 12 knots submerged, 250-mile autonomy submerged and on the surface, 24 hours on the bottom to assist the frogmen. These characteristics are compared, in table B [at end], with the characteristics of electric submarines with the same displacement.

The "Phoenix" has a double hull, four encased propellers for positioning maneuvers (in addition to the screw). It is subdivided into three compartments, two at atmospheric pressure (control cabin and engineroom) and one at higher than atmospheric pressure for four frogmen. Altogether it can carry seven or eight men. It is equipped with instrumentation for transfer navigation, including the automatic pilot, communication system, target location system, work tool system, which includes an exclusive series of manipulator arms, of microclimate conditioners also for the frogmen. The bivalent engine works on air and in closed cycle, going instantaneously from surface operation to submerged running. All very easy, now, but 9 years were needed.

On the Gaeta Slipway

This "Phoenix" belongs to the first of three scheduled classes of submarines. It will be able to operate down to 350 meters, at present the maximum practical depth for frogmen (the simulated submersion record-holders go deeper). The submarines of the other two classes will be able to go down to 2,000 meters, with a release of frogmen down to a depth of -500. The medium-range (PH-2) submarine will be able to carry a maximum of 15 persons, and the long-range (PH-3) submarine will be able to carry 22 persons. Its autonomy will be 500 miles and 24 days saturation for its frogmen. In addition to that, in all three types, in case of breakdown, the crews will be able to have a 72-hour survival time by means of regneration of the microclimate.

The "Phoenix," now being fitted out at Gaeta, was designed and built in Zingonia, where we saw it in the spring, almost completed, in the preassembly phase, within a false hull, because the real one, made of steel, was being built at Taranto. Everything inisde had been "assembled," including control panels and main ballast and trim tanks occupying the space between the two hulls. Then it was disassembled and taken to Gaeta, where the same preassembly was performed again in a shed belonging to MARITALIA, this time within the long, steel large "cigar" of the real hull that had already been subjected to strength tests by lowering it to a depth of 400 meters. It was not finished. After welding the frames to the hull, in order to attach the various parts of the submarine to it, it was disassembled again and the empty hull was sent back to Taranto for polishing and annealing. Now fitting out is in process of completion. This is a patient and very critical task, because a large number of very strict inspections are being made in every phase of it.

Foreseeable Applications of the "Phoenix"

The future applications of the "Phoenix" in the field of underwater work will be determined after the sea trials. Some of those application have already been

anticipated. Sub Sea knew what to require of its "Phoenix" when it designed it, because Sub Sea--although not the direct builder of submarines--already had previous expertise in them and also had made considerable modifications to the ones that it had acquired.

The "Phoenex" will have to perform primarily any kind of service rendered by electric submarines and all those services stemming from the availability of a larger amount of electricity produced on board by a 130-horsepower engine and those other services made possible by its complete independence from means of support on the surface. In assisting the frogmen on the bottom, in addition to supplying directly what a support ship can give them by means of the "umbilical," it will deliver electric power for their work equipment, including power for welding at a depth of 150-200 meters under water. It will also be able to operate small cranes and small water powerplants, bury underwater cables and so on. We propose to return to this subject, when the trials have been completed. For the present, let us point out that the company's old motto--"Others go under water, we work there"--takes on a completely different meaning. When the new engine works under water, it will open--it is no exaggeration to say this--a new age to science and industry, if man is really to search for other resources in the ocean. These new steel dolphins will, perhaps, be able to be the nuclear working submarine of poor countries.

Table A: Characteristics of the "Phoenix 1350-1250" Submarine With a Closed-cycle Diesel Engine

Length: 11.45 meters.
Beam: 3 meters.
Height: 3 meters.
Stern diameter of the pressure-resistant hull: 1.5 meter.
Bow diameter of the pressure-resistant hull: 1.9 meter.
Length of the pressure-resistant hull: 8.35 meters.
Maximum operating depth: 350 meters
Dry weight: 30 metric tons.
Displacement (submerged): 36 tons.
Maximum submerged speed: 12 knots.
Maximum surface speed: 7.5 knots.
Maximum surface autonomy: 24 hours.
Maximum submerged autonomy (in addition to the surface autonomy): 24 hours.
Engine power: 130 horsepower.
Oxygen load: 1,780 kilograms.
Fuel load: 960 kilograms.
Quarters:
  pilots and supervisors: 4.
  frogmen: 4-6.

[Table B on next page]

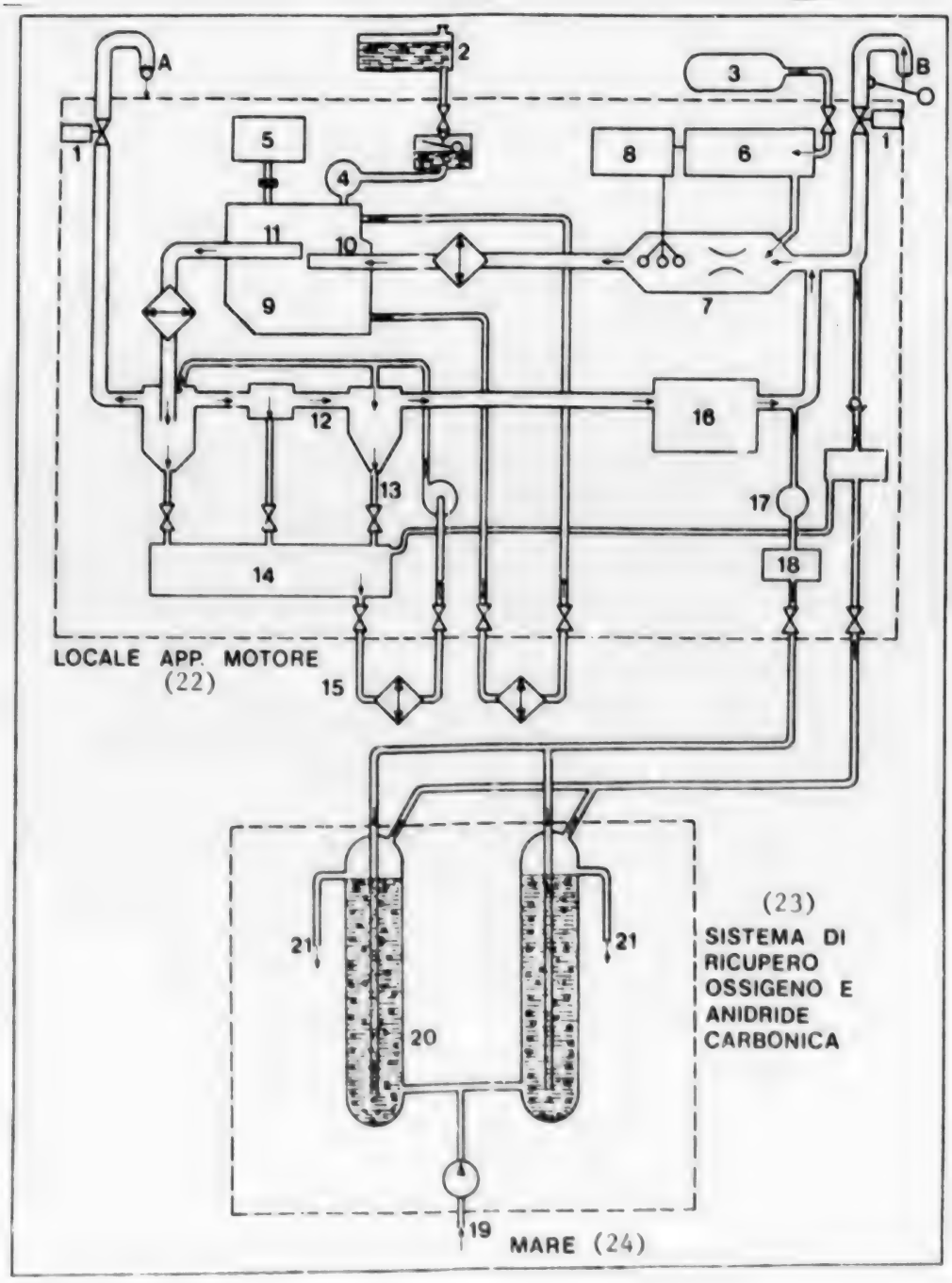
Table B: Comparison Between the Closed-cycle Diesel "Phoenix 1350-1250" Submarine and a Conventional, Electric-Battery-Driven Submarine of Equal Tonnage

	"Phoenix"	Electric Submarine
Furnished power:	130 HP	25 HP
Power density (with regard to weight):	7 HP/t	1 HP/t
Maximum speed:	12 knots	3 knots
Inspection time:	48 hours	8 hours
Frogmen, time on bottom	20-24 hours	4-6 hours
Quarters:		
pilots:	4	2-3
frogmen:	4-6	3
Comparative efficiency degrees		
a. Inspection work--time required:		
launching and submersion on the bottom:	1 hours	1 hours
work (h):	48 hours	8 hours
surfacing and recovery on board	2 hours	2 hours
energy resupply	4 hours	10 hours
Totals (H)	55 hours	21 hours
Efficiency ratio (h/H):	48/55 = 87%	8/21 = 38%
b. Release of frogmen (lockout): times taken:		
exit and submersion for work:	1 hour	1 hour
work (h)	24 hours	6 hours
resurfacing and recovery of submarine:	2 hours	2 hours
energy resupply:	4 hours	8 hours
Totals (H)	31 hours	31 hours[*]
Efficiency ratio (h/H):	24/31 = 77%	6/17 = 35%

[* sic; should read 17].

[Sketches on next two pages]

Schematic Diagram of the Bivalent Closed-cycle Diesel Engine
Under Surface and Submerged Operating Conditions



Key:

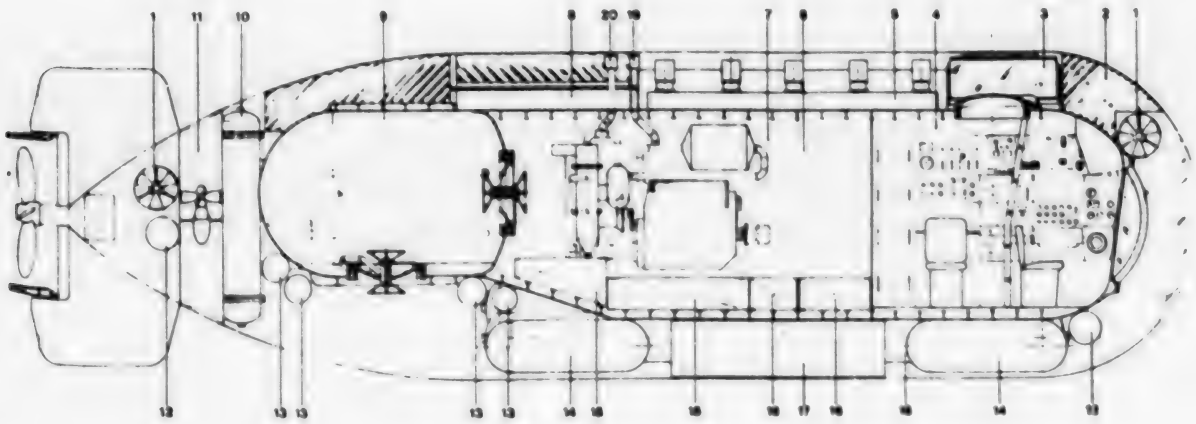
A. snorkel (exhaust)
B. snorkel (intake)
1. remote-control valves
2. fuel
3. oxygen
4. fuel pump
5. utilization charge
6. oxygen metering system
7. oxygen and recycled-gas mixer
8. oxygen analyzer and meter (computer)
9. diesel engine
10. engine intake
11. engine exhaust
12. water-gas separator

[Key continued on next page]

Key (continued):

13. exhaust gas cooling water circulating pump
14. exhaust gas cooling water tank
15. heat exchanger
16. recycled gas flow stabilizing tank
17. automatic bypass valve
18. excess gas compressor for exhaust to outside
19. seawater intake
20. seawater intake in pressure tank
21. exhaust of seawater and excess gas
22. engineroom
23. oxygen and carbon dixoide recovery system
24. sea

General Diagram of the "Phoenix 1350-1250" Submarine--Vertical Section



Key:

1. horizontal maneuvering screw
2. thrust material
3. telescopic turret
4. crew's quarters
5. transducers
6. lavatory
7. engineroom
8. waterpower distribution group
9. frogmen's quarters
10. oxygen recovery tank
11. vertical maneuvering screw
12. mercury tank
13. heat exchanger
14. trim tank
15. exhaust gas washing and compensating tank
16. compensating tank
17. solid ballast
18. oxygen tank
19. intake
20. exhaust

10,042
CSO: 3102/118

SCIENCE POLICY

CHEVENEMENT TO PROPOSE NEW RESEARCH POLICY FOR FRANCE

Paris LE FIGARO in French 13 Jan 82 p 7

[Article by Aurore Molinero: "The Chevenement Plan"]

[Text] A colloquium, a law, and the means to apply it: In sum, these are the present and future concerns and occupation of Jean-Pierre Chevenement, minister of state for scientific research and technology.

Let us begin with the means. From the very start of the 7-year term and even a little before, the tone had been announced: The Cabinet meeting of 1 July 1981 had decided to increase the amount of money devoted to research and technological development to 2.5 percent of the gross national product in 1985 (1.8 percent in 1980), and Francois Mitterrand said at the Luxembourg Palace on 22 April 1981: "What place is France to occupy in international competition? First or last? Fifth place after the United States, the USSR, Japan or the FRG or out in front? (....) I have made my choice: Over the next seven years, I want France to be in the lead in science and I shall find the means."

Finding the means is all well and good, but do we have the means? And furthermore, what means are we talking about? They imply, according to a group of official experts meeting with Hubert Curien, president of the National Center for Space Studies (CNES), that an intense effort will be made in 1983. In short, 80 billion francs (in constant 1980 francs) instead of the 50 billion per year at present, this sum to be spent until 1985. Over the 5-year period, this considerable effort would be made by the government, but by industry as well, which will be asked to increase the amount of funds spent on research substantially, although a third would come from the government. (It should be noted that both nationalized and nationalizable enterprises represent over half of all industrial research.)

This effort aimed at the recovery of research and technology, the essential objective of the interim 1982-1983 plan, discussed by the National Assembly in December, has already been described. "The public research effort, based on a vigorous policy of recruiting research personnel -- which the interim plan said should increase at an average annual rate of 4.5 percent a year (3 percent in 1980) -- should move ahead and bring along the effort of the enterprises," the minister of research told the Cabinet on 6 January 1982. He added: "Considering the provisions made within the framework of the plan concerning the evolution of the other elements of the public budgetary effort, the civilian research and development budget should increase by 17.8 percent a year."

Model of Development

An increase of 17.8 percent is a great deal. Is it possible? The days to come should provide clarifications on this aspect since it is true that the somewhat contradictory discussions are far from over between officials in the Ministry of Research and those in Finance. It is also true that Jean-Pierre Chevenement would like the law on the programming and orientation of scientific research and technology to be the subject of objectives set in figures for the budgets over the next 4 years, which is far from being a unanimously held view on the Rue de Rivoli.

This law, which will be presented to Parliament for the spring session, should therefore be both an emanation of a political will, that of the government in power, corrected by the desires and fears expressed by a scientific community understood in the broader sense of the term. What will its contents be?

One of the prime objectives which the president of the republic set was to set up a "super ministry" of research in order to have better control of a scattered policy. For the most part, this has been done. It is all the more important, therefore, to define the idea that ministry has of research and technology in general. For it, they constitute a major political stake for France, one both cultural and economic, and it is a matter of accelerating the paths to a new type of development based on the organization of labor as well as on a new world economic order.

A cultural stake, first of all: "Rejection of knowledge is the characteristic of lost societies," Chevenement has written, and for him, knowledge and progress correspond to a collective need, whose satisfaction will finally reconcile science and culture.

Next, it is a means and tool of economic, social and industrial transformation: It is necessary to mobilize, upgrade, spread information.

Disseminate Knowledge

That is why it is necessary for the minister to initiate mobilizing programs -- a notion that appeared during the regional meetings -- following themes of great social or economic significance: social (and political also, moreover), with the objective, for example, of helping the Third World or fighting social inequalities; economic, with all that it implies with respect to new production techniques, recovery of the domestic market, and with the major technological fields (such as energy, materials, electronics, biology and transportation), considered to be factors of national independence and with, in short- and medium-range terms, the establishment of programs associating the research work and technological development of laboratories under different organizations, the CNRS [National Center for Scientific Research], engineering schools, universities, industries and technical centers.

This idea of having scientists and engineers work together for several years, with common concerns and using complementary techniques and approaches, is one of those to which the Ministry of Research is particularly attached. It goes somewhat in the direction of the second objective: upgrading research.

It is commonly known that the accumulation of knowledge in the major organizations is not always published outside of them or used to the maximum by industry and the economic structure as it should be, whence, among other measures, the substantial increase in the budget of ANVAR [expansion unknown].

The third objective is the dissemination of scientific and technical knowledge within a very broad public. Research workers are determined to come out of their shell, not only in order to express themselves, but also in order to help people to understand, to explain themselves and to explain to others.

In addition to all of this are other important supplementary orientations: having basic technical research, the leaven of the future, and endowed with substantial funds, without any a priori objective. "Creative originality cannot be programmed," says Francois Gros, president of the colloquium. It is also necessary to set up a policy of scientific employment and training of men for, but also by, research, a proper intellectual school. Finally, the French language must be refashioned in order to be a vehicle of scientific and technical thought.

This implies rethinking the policy of publishing these subjects for export in the French language. This also implies having media that can disseminate information in such a way that it can be exported. We are far from that still. Nor did the colloquium on the subject provide all the means to implement this policy.

11,464
CSO: 3102/113

TRANSPORTATION

FRG AUTOMOBILE INDUSTRY LOOKS TO CERAMIC ENGINES IN FUTURE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 4 Jan 82 p 7

[Text] Eschborn, 2 Jan--The search for new forms of propulsion is not taboo for the German automobile industry, but the majority of manufacturers regards the replacement of current vehicle engines with a ceramic engine as a pipe dream. This is the conclusion reached by vwd [united industrial service], based on the results of a survey asking about the state of development in this area in the FRG, a survey conducted against the background of activities in Japan, where it is claimed that an all-ceramic, single-cylinder diesel engine, with no radiator, has been subjected to a long-term test.

In the industry there are more realistic estimates concerning the possibilities of using ceramics for particular engine parts, including the ceramic coating of metal parts. As an example, Porsche AG mentions coating exhaust valves, valve stems, valve guides or pistons. There is also research into whether exhaust manifolds, which are presently made of cast iron and, after the exhaust valves, are subjected to the most severe thermal stress, can be cast in ceramic and coated with aluminum. But even the Zuffenhausen company is not conducting a long-term test with a totally ceramic engine. The cost question is identified as the greatest difficulty, because no one is currently able to see how an all-ceramic engine can be manufactured efficiently. Porsche admits that fuel consumption could be reduced--although only marginally. The main reasons for the reduction are weight factors and the fact that the compression ratio can be increased by using temperature-resistant ceramics in exhaust valves or pistons, without reducing resistance to engine knock. Viewed over the long term, Porsche concedes that the ceramic engine has a chance, because the raw material ceramic will always be available in sufficient quantities, but a different metal used in automobile construction may perhaps no longer be available in sufficient quantities in the future.

The Bavarian Motor Works is also studying the use of ceramics in the engine. According to statements from BMW, higher processing and operating temperatures can be obtained with this material, which means higher efficiency. However, following the tests conducted so far, the company in Munich has concluded for the time being that there is still a very long way to go before a production stage is reached and it is highly unlikely in any case that anyone will start on this road in the next 10 years. Primarily, there are still technical problems to be overcome, because the qualities originally mentioned by the ceramics manufacturers have not yet been achieved at the levels promised.

Experiments are also being conducted at Daimler-Benz AG with ceramics in thermal energy machines, for example in the area of gas turbines. The Stuttgart company explained that everything is still unexplored territory in ceramics technology, with a number of "delicate points," such as combustion temperatures, load or material durability. Interestingly there was no concrete response to the question whether an all-ceramic engine was being run in a long-term test. It was pointed out that the company, for the first time, had shown a gas turbine engine with a ceramic rotor as an alternative form of propulsion, as part of the presentation of its research vehicle "Auto 2000" at the recent International Automobile Show in Frankfurt.

It was further stated that following the test runs the desired fuel consumption target "was close enough to be practical." Unfortunately, no method had been developed to mass produce this ceramics technology, the most important premise for high process temperatures and the low fuel consumption associated with it. The development of high-temperature-resistant ceramic turbine rotors was identified as the major difficulty in the construction of a low-consumption gas turbine. During the various test runs with the turbine rotors shown at the IAA International Automobile Show Daimler-Benz recorded temperatures up to 1,500° C and speeds of 60,000 revs/min.

Alternative materials are also being intensively investigated in the research department at Volkswagen AG. Intensive research work is being carried out into the use of ceramics in piston engines. According to statements from Wolfsburg, experiments using these thinner materials are being carried out to reduce the reciprocating masses of the engine, and consequently frictional losses. Some thought might also be given to positively influencing the combustion process and emissions through better thermal insulation.

At Volkswagen the combustion chamber of a diesel engine was thermally insulated with ceramic material to study these effects. The prechamber is made of aluminum-titanate, and the piston crown and the cylinder heads are coated with zircon oxide. Information indicates that the result with an induction engine is a basic redistribution of heat from the cylinder walls to the exhaust gases. In engines with an exhaust-driven turbocharger an increase in efficiency--even if a very small one--and smaller cooling surfaces could be achieved. According to the experts at Volkswagen, this insulation becomes really interesting where the secondary energy is utilized even more completely in analogous systems (as in a small steam process). Whether this will be a possibility for improvement in truck engines would again depend on how much the complexity and therefore the cost of the plant would rise in relationship to the attainable saving in fuel.

On balance the Volkswagen company confirmed that ceramic material was not a simple matter, because it was more difficult to control compared with conventional materials. Naturally the economic aspect also played a not inconsiderable role. It has been known for some time now that the Audi-NSU AG is testing ceramic linings and all-ceramic exhaust manifolds on gasoline and diesel engines with Rosenthal Technology AG. Another well-known German automobile manufacturer had "only a gentle smile" in response to the topic of the ceramic engine. As far as he knows, this Japanese "innovation" was apparently a "thimble engine," which could be suitable--if it was suitable for anything--for engines to power model airplanes or ships. In the view of this manufacturer, artificial ceramics would be unlikely to prove usable for larger engines.

CSO: 3102/106

PROTOTYPE OF FINNISH-MADE MULTIPURPOSE ELECTRIC VEHICLE

Helsinki HELSINGIN SANOMAT in Finnish 3 Jan 82 p 28

[Article: "Domestic Multipurpose Monika Ready for Production"]

[Text] Turku--The domestic multipurpose Monika motor vehicle, intended for the transportation needs of outlying districts, has been manufactured in Uusikaupunki. The vehicle's designers and builders will come from the college of applied arts and technology.

The Teijo-delivery van has been used for the body of the Monika. The motor, axles, steering mechanism, control instruments, and a number of other parts are borrowed from Saab.

The project, which is supported by Sitra [Fund for the Commemoration of Finland's Independence], was started 6 years ago as an attempt to answer the question as to what can be done to meet the transportation needs of sparcely populated areas. The answer was simply an automobile.

The project has been promoted by industrial designer Antti Siltavuori, and others involved in it have been Eero Miettinen and Markku Salo from the institute of industrial arts as well as Jari Anttila and Ari Lahteenmaki from the technical college.

The collection of information took place in the years 1976--1977, after which the basic concept of the vehicle was formulated to include a 4-6 passanger cab. The passenger section of the cab can be entirely converted into a cargo section if needed.

The fitting together of the vehicle's body and other parts was accomplished by means of practical experiments. The Teijo-delivery van was disassembled completely and the location of some of the engine parts had to be changed.

A Doppel-Cab as a Body Alternative

The so-called doppel-cab, whose passenger section can be converted into a flat bed in its entirety, was seen as the best alternative for the body of the vehicle. The bed's roof and side walls are stationary. A movable element, from which the back wall of the doppel can be obtained, has been concealed in the roof by tracks.

If needed, the passenger cab can be completely converted into a cargo section.

According to the design the rear window of the cab is also the rear window of the rear passenger section. Additional passenger seats are located in the wall between the forward cab and the passenger section.

The conversion of the delivery van into a six-passenger doppel takes only a few seconds. A tubular frame, which functions as a support structure for the fibre-glass body, was chosen for the structure of the body. The front wall of the cab and the wall between the cab and the passenger section were made from a steel plate for safety reasons.

The dashboard is designed in such a way that all the controls and instrument displays are within the driver's field of vision and can be reached without stretching. The steering wheel, dashboard, and other control devices are adapted from the Saab-99.

The dimensions of the vehicle are built around the cab. The purpose was to to make the cab as suitable for passenger use as possible and to get away from the unergonomic upright clear position generally characteristic of delivery vans.

An attempt has been made to keep the outside dimensions of the vehicle as small as possible. Its length is equivalent to a medium-size passenger car and its width as well as the cargo facilities correspond to that of a medium-size delivery van.

The designing and construction of the Monika entailed 3 man-years. The vehicle is not on the market.

10576
CSO: 3102/96

NEW VOLVO TO MAKE DEBUT AT GENEVA SHOW IN MARCH

Copenhagen BERLINGSKE TIDENDE in Danish 6 Jan 82 p 9

[Article by Finn Knudstrup]

[Text] A new car from the Swedish automotive giant is just around the corner, although Volvo is reluctant to admit it officially. But the planners of the International Automobile Exhibition to be held in Geneva this March have made known that Volvo has ordered a rotating platform and large spotlights. In other words, the Swedes will exhibit something unusual.

Throughout 1981 Swedish newspapers presented drawings and spy photos of the new automobile, but the factory has refused to make public any illustrations or technical information. This is often the case, however, since an automobile manufacturer seldom is interested in making people "look forward" to a new car a year in advance. This would affect sales of the current model.

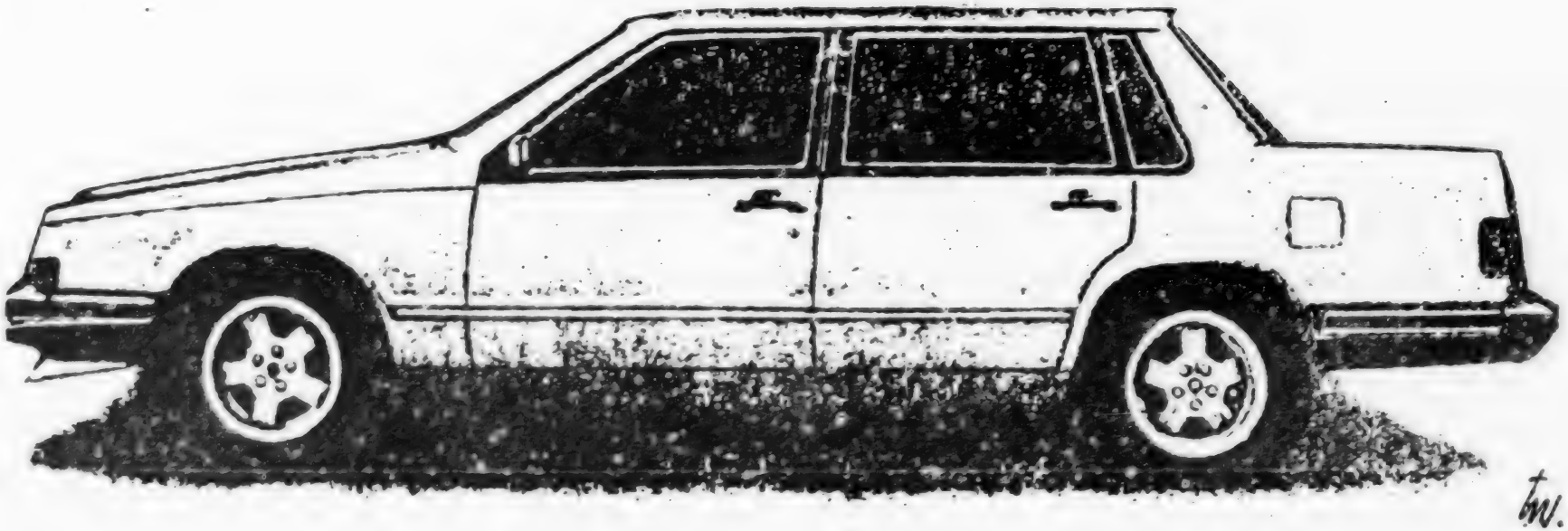
BERLINGSKE illustrator Tom Wikborg presents here his view of how the new Volvo will look. His background material is from the information and drawings that constantly flourish in Sweden. Now it is only a matter of weeks before the factory sends out the first official picture of the new car which is guaranteed to make its world debut at the Geneva exhibition.

More Economical

The car is still in the large class, but it is reported to be several kilograms lighter and equipped with a computer-controlled engine so that it will average well over 10 km/liter. Today the automobile giant produces cars that run only 10 and 11 km/liter.

The car will still have back-wheel drive, but recent Volvos have demonstrated good maneuverability with back-wheel drive.

It is also reported that the new Volvo contains much aluminum. Volvo's entry into the steel industry with its investments in Norway enables the company to use new materials. When Volvo entered the Norwegian metal



Artist Tom Wikborg based this drawing of the new Volvo on his impressions from drawings and spy photographs. It is believed to resemble quite well the actual car which will make its world debut in Geneva in 2 months.

industry it was reported that one of the purposes was to develop automobile parts based on aluminum. Since then Volvo has allied itself with Renault, with respect to both stock and automobile development, and Renault also has many plans for the future which may appear in the new Volvo, which was made economically feasible by Volvo's merger with the other large Swedish company Beijerinvest.

Volvo continues to manufacture its full-sized sedan because it is represented, in part, in the small car market by the 340 series produced in Holland, although for some time the 340 series has not been among the truly popular cars.

French Mini from Volvo

For this reason, since the beginning of this year, Volvo has been the Scandinavian importer of the Renault 5 mini-car, which now will be sold side by side with the Swedish and Dutch cars, beginning at 64,842 kronor.

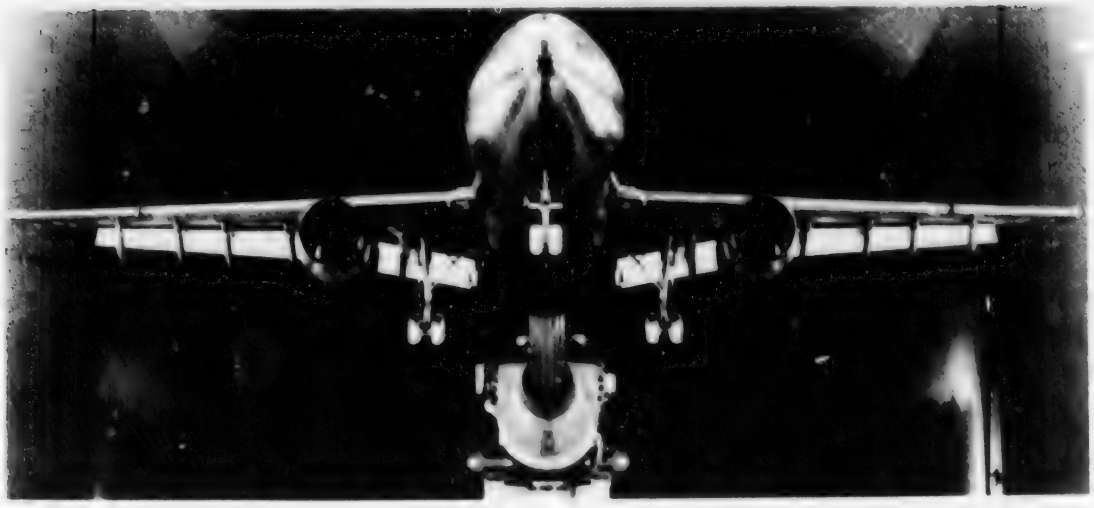
In this way Volvo has built an automobile program based on a mini, a midi, and a maxi and, in order not to destroy Volvo's chances of selling its own cars, it was decided that only the Renault 5 TL and TS would be sold. The 14, 18, 20, 30, and Fuego, as well as the completely new 9's will not be imported to Scandinavia, to the dismay of many automobile lovers. The new 9's have been declared "Car of the Year in Europe," while the Fuego was among the favorites for "Car of the Year in Denmark."

9336
CSO:3102/103

AIRBUS WIND TUNNEL TESTS PROMISE IMPROVED PERFORMANCE

Gelsenkirchen AEROKURIER in German Nov 81 p 1374

[Text]



The new A300-600 Airbus is already "flying" in the wind tunnel to everyone's complete satisfaction: Initial measurements in the German-Dutch wind tunnel confirmed good takeoff and landing characteristics for the future A300-600 Airbus. The 1:9.5 scale model, built for the Ministry for Research and Technology by VFW [Consolidated Aircraft Works] has a wing span of 4.5 meters and weighs about 1 and 1/2 tons. The landing flaps, clearly recognizable on the model, were developed jointly by British Aerospace and VFW. Compared with the previous A300, they will give the A300-600 better aerodynamic behavior, that means higher liftoff weight with the same thrust. Additional measurements on the model will be taken in the spring of 1982. The A300-600, which will be equipped with the most modern technological systems, will be delivered in 1984.

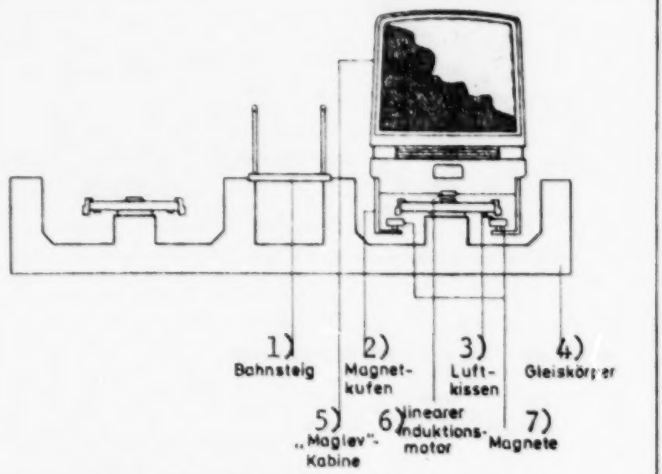
9581
CSO: 3102/106

BRITISH MAGNETIC LEVITATION LINE TO BEGIN OPERATION SOON

Wuerzburg ELEKTROTECHNIK in German 12 Oct 81 p 11

[Text] According to plans formulated in Great Britain, a magnetic levitation train system will soon be operating between the Birmingham airport and the nearby train station of the fair grounds via a 600-meter railroad line. In unmanned shuttle service, the individual cars will operate either in accordance with a fixed schedule or in accordance with demand. At the top speed of 42 km per hour, the trip takes approximately 90 seconds. An induction motor makes the cars--lifted and guided by electromagnets--move along their guide rail. The function of the wheels, springs and shock absorbers of conventional vehicle suspension systems is assumed by the so-called Maglev (magnetic levitation suspension), a contactless suspension and guidance system. Levitation magnets are placed at the four corners of each car. These magnets run below steel rails that lie on the T-shaped concrete rail and that are attracted by the magnets. The car thus is lifted off the guide rail so that it practically floats in the air. As long as the car is suspended, the magnets and the guide rail are separated by an air cushion 15 mm thick. At the stops, the car rests on skids, which in the event of a power failure during operation assume the function of an emergency brake. Levitation and propulsion require separate power-supply systems of 300 or 600 volt. Each system requires a set of power rails, since in contrast to conventional railroad systems the guide rails cannot be used as return lines. Each car contains a battery along with a generator, which provides power for the control and communication systems, the door-opening and closing mechanism and the ventilation and emergency lighting systems. At the beginning, the system will have three cars--one car for each line and one reserve unit. Each unit is 6 meters long and 2.25 meters wide and provides standing room for 35 passengers, including the baggage. Within the time span of 15 minutes, the system--operating with just two units--can transport 190 passengers in either direction. If necessary, it will be possible to run trains consisting of two units, in order to double the capacity.

Cross-Section of a "Maglev" Cabin Equipped With Magnetic Levitation Suspension



Schnitt durch eine „Maglev"-Kabine mit magnetischer Levitationsaufhängung

Key:

1. Platform
2. Magnetic skids
3. Air cushion
4. Railbed
5. "Maglev" cabin
6. Linear induction motor
7. Magnets

8760
CSO: 3102/81

BRIEFS

AIRBUS SALES EXCEED FIVE HUNDRED--Middle East Airlines (MEA) has placed firm orders with Airbus Industrie for five A 310 Airbuses, production of which will begin in the coming year, and at the same time taken out options for 14 of the small Airbus. An agreement to this effect was signed recently in Paris. This brings the number of orders for all versions of the Airbus above the magic boundary of 500 machines. [Text] [Gelsenkirchen AEROKURIER in German Nov 81 p 1372] 9581

FINAL ASSEMBLY OF A 310--Attachment of a wing and of the elevator unit marked the completion of assembly of the first Airbus 310 for Swissair in Toulouse (France). At present, work is in progress on the Forward Facing Crew Cockpit (FFCC) and the first tests (electrical system, oxygen, clocks and intercom) have been run. In regard to the question concerning operation of a A 310 with two or three crew members, Lufthansa's executive board at its session of 13 October confirmed its decision that the small Airbus 310 (210 seats; the A 300 has 253 seats) operate with a two-man crew, if it gets licensed--as expected--for two-man operation. Through its decision, the executive board acknowledged the present state of engineering, the latest test results--including the statements of the expert commission appointed by the U.S. president and the work-stress studies of the producer--and the possitive results obtained in operating aircraft with two-man crews such as the Boeing 737. [Text] [Duesseldorf VDI NACHRICHTEN in German 23 Oct 81 p 1] 8760

PLASTICS IN AUTOMOBILES--Together with industry, Great Britain's Ministry of Industry has invested 1.4 million pounds in a development project aimed at producing wheels, coil springs, and other vehicle components of plastic rather than metal. Backing the development project, which is expected to take 3 years, is a consortium made up of manufacturers and suppliers. Financial support is being provided by the Ministry of Industry's Mechanical and Electrical Engineering Requirements Committee. The substitution of plastics for metal has the advantage of reducing weight, with consequent fuel savings. The project is headed by the NEL (National Engineering Laboratory) in East Kilbride. [Text] [Helsingborg PLASTFORUM SCANDINAVIA in Swedish No 12, 1981 p 14] 11798

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Feb 17, 1982